U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Eurycea waterlooensis*

COMMON NAME: Austin blind salamander

LEAD REGION: Region 2

INFORMATION CURRENT AS OF: October 2005

STATUS/ACTION:
___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
  ___ Non-petitioned
  _X_ Petitioned - Date petition received: May 11, 2004
    _ 90-day positive - FR date:
    _ 12-month warranted but precluded - FR date:
    _ Did the petition requesting a reclassification of a listed species?

  FOR PETITIONED CANDIDATE SPECIES:
  a. Is listing warranted (if yes, see summary of threats below)? Yes
  b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes
  c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.
  During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, emergency listings, and essential litigation-related, administrative, and program management functions. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).
  ___ Listing priority change
    Former LP: ___
    New LP: ___
  Date when the species first became a Candidate (as currently defined): June 2002

___ Candidate removal: Former LP: ___
  ___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or

continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F – Range is no longer a U.S. territory.
___ I – Insufficient information exists on biological vulnerability and threats to support listing.
___ M – Taxon mistakenly included in past notice of review.
___ N – Taxon does not meet the Act's definition of "species."
___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Amphibian, Plethodontidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Texas

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Travis County, Texas

LAND OWNERSHIP: The only known locations for the Austin blind salamander are within a city park owned and operated by the City of Austin Parks and Recreation Department. The recharge and contributing zones of the Barton Springs Segment of the Edwards Aquifer are a combination of municipal and private lands.

LEAD REGION CONTACT: Susan Jacobsen, 505-248-6641

LEAD FIELD OFFICE CONTACT: Austin Ecological Services, Paige Najvar, 512-490-0057

BIOLOGICAL INFORMATION

Species Description: A morphological description of the Austin blind salamander was published by Hillis et al. (2001). This species has external feathery gills, a pronounced extension of the snout, no external eyes, 12 costal grooves, and weakly developed tail fins. In general appearance and coloration, the Austin blind salamander is more similar to the Texas blind salamander (*Eurycea rathbuni*) that occurs in the Southern Segment of the Edwards Aquifer than its sympatric species, the Barton Springs salamander (*Eurycea sosorum*). The Austin blind salamander has a reflective, lightly pigmented skin with a pearly white or lavender appearance (Hillis et al. 2001).

Taxonomy: A taxonomic description of the Austin blind salamander was published by Hillis et al. (2001). Juvenile salamanders had been sighted occasionally in Barton Springs and thought to be a variation of the Barton Springs salamander (*Eurycea sosorum*). However, the observed juveniles more closely resembled the Texas blind salamander (*Eurycea rathbuni*), and it wasn't until recently that enough specimens were available to formally describe these juveniles as a separate species using morphological and genetic characteristics (Hillis et al. 2001).

Habitat/Life History: The Austin blind salamander occurs in and around Barton Springs in Austin, Texas. These springs are fed by the Barton Springs Segment of the Edwards Aquifer. This segment covers roughly 155 square miles (401 square kilometers) from southern Travis County to northern Hays County, Texas. It has a storage capacity of over 300,000 acre-feet (Barton Springs/Edwards Aquifer Conservation District 2004). The Edwards Aquifer is a karst aquifer characterized by open chambers such as caves, fractures, and other cavities that were formed either directly or indirectly by dissolution of the subsurface rock formations. Given the reduced eye structure and the fact that the Austin blind salamander is rarely seen at the surface, this salamander is thought to be more subterranean than the aquatic surface-dwelling Barton Springs salamander.

This salamander is a fully aquatic and neotenic species, meaning they retain their larval, gill-breathing characteristics throughout their lives. These neotenic salamanders do not metamorphose and leave water. Instead, they live in water throughout their life cycle where they become sexually mature and eventually reproduce.

The Austin blind salamander inhabits relatively stable aquatic conditions at Barton Springs. These conditions consist of perennially flowing spring water that is generally clear, clean, mostly neutral (pH about 7), and stenothermal (narrow temperature range) with an average annual temperature of 21° to 22°C (about 70° to 72°F) (U.S. Fish and Wildlife Service 2005).

Historical and Current Range/Distribution: The Austin blind salamander is found in three of the four Barton Springs outlets in the City of Austin's Zilker Park, Travis County, Texas: Parthenia (Main) Springs, Eliza Springs, and Sunken Garden (Old Mill) Springs. The Main Springs form the Barton Springs Swimming Pool. The Austin blind salamander has not been observed at the fourth Barton Springs outlet, known as Upper Barton Springs (Hillis et al. 2001). The only known sites have been significantly modified for human use. The area around Main Springs was impounded in the late 1920s to create Barton Springs Swimming Pool, and flows from Eliza and Sunken Garden springs are also retained by concrete structures, forming small pools on either side of Barton Springs Pool (U.S. Fish and Wildlife Service 1997, U.S. Fish and Wildlife Service 2005).

Population Estimates/Status: From January 1998 to February 2002, there were only 120 documented observations of the Austin blind salamander. During this same time frame, 2,059 Barton Springs salamanders have been observed (Hillis et al. 2001). This species spends a large portion of its life underground; therefore, the technology to safely and reliably mark salamanders for individual recognition has not been developed. Also, surveying within the Edwards Aquifer cannot be done at the current time. For these reasons, population estimates are not currently possible. However, when they are found, the Austin blind salamanders appear to occur in relatively low numbers. Between January 2002 and November 2002, an average of nine Austin blind salamanders was found per survey visit at Old Mill Springs (Chamberlain and O'Donnell 2003). Most of the Austin blind salamanders that were observed during these surveys were juveniles (less than 1-inch in total length).

City of Austin biologists are currently working to discover more about the reproductive biology of the Austin blind salamander. The City of Austin's captive breeding program houses 24 individuals of this species. Only one female Austin blind salamander has reproduced in captivity, resulting in a clutch of 28 eggs (Dee Ann Chamberlain, City of Austin, pers. comm., 2004).

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range. Primary threats include the chronic and catastrophic degradation of water quality and loss of adequate springflow at Barton Springs. The hydrologic connections between groundwater and surface water in the Barton Springs watershed are the ecological basis for maintaining adequate water quality for organisms that depend on the aquifer for survival, such as the Austin blind salamander. Urbanization within the central Texas region is rapidly expanding. Based on population projections from the Texas State Data Center (2000), Travis County is expected to double in size between 1990 (population 576,407) and 2030 (population projection 1,362,538). The City of Austin (in Travis County) is one of the fastest growing cities in the United States and experienced a 17 percent growth rate between 1990 and 1998 (U.S. Census Bureau 2000).

Urbanization can dramatically alter the normal hydrologic regime and water quality of an area. Increases in impervious cover resulting from urbanization have been shown to cause measurable water quality degradation (Klein 1979, Bannerman et al.1993, Center for Watershed Protection 2003). Impervious cover in a stream's watershed causes streamflow to shift from predominantly baseflow, which is derived from natural filtration processes and discharges from local groundwater supplies, to predominantly stormwater runoff. Stormflows carry pollutants and contaminants into stream systems (Klein 1979, Bannerman et al. 1993, Schueler 1994, Barrett and Charbeneau 1996, Dartiguenave et al. 1997, Center for Watershed Protection 2003). With increasing stormflows, the amount of baseflow available to sustain water supplies during drought cycles is diminished and the frequency and severity of flooding increases. The increased quantity and velocity of runoff increases erosion and streambank destabilization, which in turn leads to increased sediment loadings, channel widening, and detrimental changes in the morphology and aquatic ecology of the affected stream system (Hammer 1972, Booth 1990, Booth and Reinelt 1993, Scheuler 1994, Dartiguenave et al. 1997, Pizzuto et al. 2000, Center for Watershed Protection 2003).

Even at relatively low levels of impervious cover, "profound and often irreversible impacts to the hydrology, morphology, water quality, habitat, and biodiversity of streams" can occur (Schueler 1994). Both nationally and locally, consistent relationships between impervious cover and water quality degradation have been documented. In a study of pollutant loads from various land use areas in Austin, stormwater runoff pollutant loads were found to increase with increasing impervious cover. This study also found that pollutant loading rates of the more urbanized watersheds were higher than those of the small suburban watersheds (City of Austin 1990). Soeur et al. (1995) determined that stormwater pollution loadings were correlated with development intensity in Austin.

Increases in impervious cover exceeding 10 percent are associated with measurable water quality degradation, loss of sensitive aquatic organisms, reduction in stream biodiversity, stream warming, and channel instability within a watershed (Schueler 1994). Stream aquatic life problems such as loss of species diversity, malformations, and death have been identified in watersheds having impervious cover of at least 12 percent, with severe problems in watersheds with impervious cover greater than 30 percent. Generally, stream quality impairment can be prevented if watershed imperviousness does not exceed 15 percent and for more sensitive stream ecosystems watershed imperviousness should not exceed 10 percent (Klein 1979). The Lower Colorado River Authority (Lower Colorado River Authority 2002) conducted a water supply study of the recharge and contributing zone areas within the Barton Springs Segment of the Edwards Aquifer that looked at the amount of impervious cover within the area. The eight watersheds within the area had a range of impervious cover from 3.2 percent to 28.9 percent in 2000. The projected impervious cover limits for the same eight watersheds in 2025 ranged from 4.8 percent to 31.6 percent (Lower Colorado River Authority 2002). The two watersheds, Williamson Creek and Sunset Valley Creek (a tributary to Williamson Creek), with the highest percentage of impervious cover are also the second closest to the Barton Springs.

In addition, sediments discharging from karst aquifers play a fundamental role in determining water quality (Mahler et al. 1999). Sediments have a direct impact on habitat quality and act as a sink and transport mechanism for contaminants (Menzer and Nelson 1980). Karst aquifer systems are more vulnerable to the effects of pollution than other aquifer systems because of thin surface soils, high groundwater flow velocities, and the relatively short time water is resident within the system (Ford and Williams 1994). Surface derived sediments have the greatest potential to concentrate and transport contaminants because of their high organic carbon content and their potential exposure to contaminants at the surface (Mahler and Lynch 1999).

Because stormwater moves sediment through karst systems in a pulsed fashion, impacts to the aquifer are not limited to the relatively short duration of runoff events. Generally, stormwater pollutants attach to sediments and become part of the sediment system (Burton 1992). The term "attach" is used to describe the processes of complexation, adsorption, absorption, and secondary physical and chemical processes that incorporate pollutants into the inorganic and organic matrices of soil and sediment. Sediment is moved through the Barton Springs Segment of the Edwards Aquifer in pulses caused by storm events (Mahler and Lynch 1999). Sediments (with attached pollutants) may deposit within the aquifer and be resuspended during subsequent storm events.

In an analysis performed by the City of Austin (2005), significant changes over time were reported for several chemical constituents and physical parameters in Barton Springs Pool. Conductivity, turbidity, sulfates, and total organic carbon have increased while the concentration of dissolved oxygen has decreased. The significance and presence of trends are variable depending on flow conditions (baseflow vs. stormflow, recharge vs. non-recharge) and could be attributed to impacts from watershed urbanization. These data indicate a long-term trend of water quality degradation at Barton Springs over the past 25 years (City of Austin 2005).

Four pesticides (atrazine, carbaryl, diazinon, and simazine) were documented at Barton Springs Pool and Eliza Springs in samples taken during and after a two-day storm event (Mahler and Van

Metre 2000). Atrazine, carbaryl, diazinon, and simazine at the springs were found at levels below the exhibited toxicity to aquatic animals. Although concentrations of these pesticides are below criteria set in the aquatic life protection in the Texas Surface Water Quality Standards, increases in pesticide concentrations could adversely affect aquatic organisms.

The Austin blind salamander and its prey species are directly exposed to sediment-borne contaminants discharging through the spring outlets. Trace metals such as arsenic, cadmium, copper, lead, nickel, and zinc, and sediment have been found in Barton Springs in the early 1990s (City of Austin 1997). Adverse effects to the salamander and its prey species may occur when water quality criteria for sediment contaminants are exceeded. These effects may include reduced growth and weight, abnormal behavior, morphological and developmental aberrations, and decreased reproductive activity (Albers 2003). Criteria for evaluating the quality of sediment contaminants as suggested by the Texas Commission on Environmental Quality (TCEQ) (formerly the Texas Natural Resource Conservation Commission (TNRCC)) (Texas Natural Resource Conservation Commission 2000), MacDonald et al. (2000), and Environmental Protection Agency (1997) have been exceeded in approximately one-half of samples taken from salamander habitat (City of Austin 1995-2001, unpublished data). Sediment samples taken in creeks supplying water to habitat of the Austin blind salamander have also exceeded these criteria at various times (City of Austin 1995-2001, unpublished data).

Another potential threat to the Austin blind salamander and its ecosystem involves low flow conditions in the aquifer and at Barton Springs. The long-term mean flow at the Barton Springs outlets is 54 cfs. The lowest recorded flow recorded at Barton Springs was about 10 cfs during a record drought in the 1950s (City of Austin 1998, Barton Springs/Edwards Aquifer Conservation District 2004). Discharge at Barton Springs decreases as water storage in the Barton Springs Segment of the Edwards Aquifer drops. Large declines in aquifer levels have historically been due to a lack of adequate rainfall recharging the aquifer. In a 2004 groundwater flow modeling study, the Barton Springs/Edwards Aquifer Conservation District (BS/EACD) predicted that under drought-of-record conditions and current pumping levels, the mean monthly springflow would be about 1 cfs for a month. This study also indicated that under drought-of-record conditions, projected pumping rates for future years would cause Barton Springs to cease flowing for at least 4 months.

B. <u>Overutilization for commercial, recreational, scientific, or educational purposes</u>. Because the Austin blind salamander is a newly described species and is currently unprotected through regulatory mechanisms, collectors may be interested in obtaining specimens. However, the City of Austin monitors the sites where both Austin blind and Barton Springs salamanders are found on a regular basis, so the threat of collection is probably small.

C. <u>Disease or predation</u>. A recently discovered pathological condition affecting Barton Springs salamanders may also threaten the Austin blind salamander. Between January 28, 2002 and June 26, 2002, 17 Barton Springs salamanders were found at Upper Barton Springs and 2 at Sunken Garden Springs, where the Austin blind salamander also occurs, with bubbles of gas occurring throughout their bodies. Three similarly affected Barton Springs salamanders also were found at Upper Barton Springs in February and March 2003 (Dee Ann Chamberlain, pers. comm. 2003).

Of the 19 salamanders affected in 2002, 12 were found dead or died shortly after they were found. Both adult and juvenile Barton Springs salamanders have been affected.

The incidence of gas bubbles in salamanders at Barton Springs is consistent with a disorder known as gas bubble disease or gas bubble trauma (Bouck 1980; Crunkilton et al. 1980; Finckeisen et al. 1980; Montgomery and Becker 1980; Colt et al. 1984a, 1984b; Krise 1993; Krise and Smith 1993; Fidler and Miller 1994; Mayeaux 1994). In gas bubble trauma, bubbles below the surface of the body and inside the cardiovascular system produce lesions and necrotic tissue that can lead to secondary infections (Fidler and Miller 1994). Death from gas bubble trauma is apparently related to an accumulation of internal bubbles in the cardiovascular system (Fidler and Miller 1994). Pathology reports on affected animals at Barton Springs found that the symptoms were consistent with gas bubble trauma and that no other problems such as pathogens were indicated (Chamberlain and O'Donnell 2003). Gas bubble trauma was suspected in several other species at Barton Springs including Mexican tetras (*Astyanax mexicanus*), mosquito fish (*Gambusia affinis*), Rio Grande leopard frog (*Rana berlandieri*) tadpoles, crayfish (*Procambrus clarki*), and beetle larva (Hydrophilidae) (Chamberlain and O'Donnell 2003). All of these species had problems with buoyancy, and individuals of the two fish species had bulging eyes. The symptoms of buoyancy problems and bulging eyes in these species are also consistent with gas bubble trauma. No Austin blind salamanders have been found with this condition. However, this species is dependant on the same habitat conditions as the Barton Springs salamander; therefore, gas bubble trauma is believed to also threaten the survival and long term sustainability of the Austin blind salamander.

D. <u>The inadequacy of existing regulatory mechanisms</u>. The Barton Springs salamander, a species that is sympatric to the Austin blind salamander, is federally and state listed as endangered. The City of Austin is covered for incidental take of the Barton Springs salamander from its swimming pool maintenance activities through a section 10(a)(1)(B) permit and associated Habitat Conservation Plan (City of Austin 1998b). The Austin blind salamanders that exit the aquifer and enter the pool also benefit from these protection measures.

Nonpoint source pollution controls are required in a variety of local ordinances, which range from relatively strict controls by the City of Austin in its Extraterritorial Jurisdiction to lesser controls in outlying areas. Some of the protections provided in these ordinances include riparian buffers, permanent water quality control structures, and impervious cover limitations. Texas Commission on Environmental Quality also adopted the Edwards Rules in 1995 and 1997, which require a number of water quality protection measures for new development occurring in the recharge and contributing zones of the Edwards Aquifer. Although there are no restrictions on impervious cover in the Edwards Rules, the regulations do provide incentives to developers in the form of exemptions and exceptions from permanent water quality control mechanisms for developments with less than 20 percent impervious cover.

Based on trend data that shows degradation of water quality at Barton Springs over the years (City of Austin 2005), existing regulations for maintaining water quality may not adequately protect the Barton Springs and the Austin blind salamanders. To date, no comprehensive study has been conducted to evaluate the effectiveness of existing state and local regulations in protecting water quality in the Barton Springs watershed. In addition, Chapter 245 of the Texas Local Government Code permits "grandfathering" of state regulations. Grandfathering allows developments to be exempted from any new local or state requirements for water quality controls and impervious cover limits providing that the developments were planned prior to the implementation of such regulations. However, these developments are still obligated to comply with regulations that were applicable at the time when project applications for development were first filed. The potential impact of the grandfathering statute as enacted by the State of Texas has not been examined with respect to existing regulations that protect water quality in the Barton Springs watershed.

E. <u>Other natural or manmade factors affecting its continued existence</u>. The Austin blind salamander has a very limited distribution. Amphibians, particularly during egg and larval stages, are sensitive to many pollutants, such as heavy metals; certain insecticides, particularly cyclodienes (endosulfan, endrin, toxaphene, and dieldrin), and certain organophosphates (parathion, malathion); nitrite; salts; and petroleum hydrocarbons (Harfenist et al. 1989). Because of their semipermeable skin, the development of their eggs and larvae in water, and their position in the food web, amphibians can be exposed to waterborne and airborne pollutants in their breeding and foraging habitats. Toxic effects to amphibians from pollutants may be either lethal or sublethal, including morphological and developmental aberrations, lowered reproduction and survival, and changes in behavior and certain biochemical processes. Because the salamander is fully aquatic, it cannot escape from contamination or other threats to its habitat. Crustaceans, particularly amphipods, on which the salamander feeds are especially sensitive to water pollution (Mayer and Ellersieck 1986; Phipps et al. 1995; Burton and Ingersoll 1994).

CONSERVATION MEASURES PLANNED OR IMPLEMENTED: The conservation actions listed below were primarily undertaken to protect the endangered Barton Springs salamander. Because the Austin blind salamander is sympatric with the Barton Springs salamander and has the same habitat requirements, this species is benefiting from these actions as well.

1. <u>Land acquisition</u> - Land acquisition in the Barton Springs watershed benefits both the Barton Springs and the Austin blind salamanders through preservation of open space, and therefore water quality, over the recharge zone. The City of Austin has acquired (including fee title purchases and conservation easements) over 16,600 acres of open space within the Barton Springs watershed. The City of Austin and Travis County have also purchased land within the Barton Springs watershed as mitigation for a regional habitat conservation plan for other listed, terrestrial species. Other organizations such as the Hill Country Conservancy are working to set aside open space to preserve land and water quality.

Thousands of acres over the Barton Springs Segment of the Edwards Aquifer have already been set aside for conservation purposes and may be beneficial to the Austin blind salamander by protecting water quality. It is reasonably certain that more land acquisition over this segment of the aquifer will take place in the future and that this land will contribute to the protection of water quality at Barton Springs. However, it has not yet been demonstrated that these land acquisitions have been effective.

2. Water Quality Protection Recommendations - In September 2000, a set of water quality protection recommendations were developed and distributed to local jurisdictions within the Barton Springs watershed. They were also incorporated into a Memorandum of Understanding between the U.S. Fish and Wildlife Service (Service) and the Lower Colorado River Authority (LCRA) to off-set impacts from the LCRA pipeline. A working group, which represented broad expertise in water quality protection technology and consisted of staff from City of Austin, LCRA, University of Texas at Austin, and local engineering firms, developed this document in an effort to outline site-specific management actions designed to minimize water quality degradation from new development in the Barton Springs watershed. In addition to developments receiving water from the LCRA pipeline, these recommendations have also been used in other large developments to help minimize water quality impacts within the Barton Springs watershed.

The TCEQ has recently developed voluntary water quality protection measures for development in the Edwards Aquifer region of Texas. In February 2005, the Service concurred that these measures, if implemented, would protect several aquatic species from take that would otherwise occur due to water quality degradation resulting from development in the Edwards Aquifer region. Although the Austin blind salamander was not specifically named in this concurrence, the measures, if implemented, could affect this species.

The Service is also committed to working with a variety of groups that are involved in monitoring water quality and biological resources within the Edwards Aquifer region. These groups are willing to share the results of their monitoring to be used for trend analyses. If analysis of this monitoring information indicates water quality degradation is occurring, then TCEQ and the Service will meet to evaluate the causes and, if necessary, take additional actions to ensure the protection of the aquatic species that depend on the Edwards Aquifer for survival.

A number of new developments within the Barton Springs Segment of the Edwards Aquifer have been constructed in accordance with the water quality protection measures that were designed to off-set impacts from the LCRA pipeline. It is not certain if the voluntary measures developed by TCEQ will be implemented. Given that the specific water quality requirements necessary for the salamander to continue to survive in its environment are not yet known, the effectiveness of these measures to protect water quality for the salamander may be difficult to demonstrate.

3. City of Austin and Texas Department of Transportation National Pollutant Discharge Elimination System (NPDES) Permits - The City of Austin and Texas Department of Transportation are monitoring development and traffic to provide data necessary to implement a long term program to reduce pollutant loading.

4. City of Austin’s Action Plan to Address Top Ten Pollutant Sources - The City of Austin’s Watershed Protection and Development Review Department has summarized the top pollutant sources in the Barton Springs watershed and have developed action plans that outline the steps needed to reduce pollutant loading from each source.

5. Efforts to Protect Surface Habitat - The City of Austin (1998b) is implementing a habitat conservation plan to avoid, minimize, and mitigate incidental take of the Barton Springs salamander resulting from the continued operation and maintenance of Barton Springs Pool and adjacent springs. Many of the provisions of the plan also benefit the Austin blind salamander. Such provisions include a) training lifeguard and maintenance staff to protect salamander habitat, b) controlling erosion and preventing surface runoff from entering the springs, c) ecological enhancement and restoration, d) monthly monitoring of salamander numbers, e) public outreach and education, and f) establishment and maintenance of a captive breeding program which includes the Austin blind salamander.

SUMMARY OF THREATS: The primary threats facing the Austin blind salamander are the degradation of the quality and quantity of water that feeds Barton Springs as a result of urban expansion over the watershed. The restricted range of the salamander makes it vulnerable to both acute and chronic groundwater contamination. The salamander is also vulnerable to catastrophic hazardous materials spills, increased water withdrawals from the Edwards Aquifer, and impacts to its surface habitat.

For species that are being removed from candidate status:
____Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES: Since this species occurs in and around three of the spring sites that are also known to support the federally-endangered Barton Springs salamander, recommended conservation measures follow those outlined for the Barton Springs salamander in the Barton Springs Salamander Recovery Plan (U.S. Fish and Wildlife Service 2005). Such conservation efforts should include developing and implementing comprehensive regional plans to address water quality and quantity threats. A plan to protect or enhance water quality should include measures for projects constructed over contributing and recharge zones of the Barton Springs Segment of the Edwards Aquifer. Such measures should include impervious cover limits, buffer zones for streams and other sensitive environmental features, low-impact developments, structural water quality controls and other strategies to reduce pollutant loads. Land preservation through acquisition, conservation easements, or deed restrictions also can provide permanent protection for water quality and quantity. Programs should be developed to reduce pollutant loading from already existing development and other potential sources of pollutants such as golf courses and transportation infrastructure. The City of Austin should continue their efforts to protect the surface habitat of the salamander.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1

		Species	2*
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: Limited distribution of this species makes it extremely vulnerable to extinction from degradation of water quality and decreased water quantity. Because the Austin blind salamander is known from only three spring sites and must rely on clear, clean spring discharges from the Edwards Aquifer for its survival, the entire population is facing these threats.

Imminence: The Austin blind salamander occurs in one of the most rapidly growing regions in the United States. Data indicate a long-term trend of water quality degradation at Barton Springs over the past 25 years (City of Austin 2005). Expanding urbanization in the Barton Springs Segment of the Edwards Aquifer is currently ongoing and more development in this area is planned for the near future, making the loss of spring flow and degradation of water quality an imminent threat of total habitat loss.

__X__ Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? Yes

Is Emergency Listing Warranted? Emergency listing is not warranted at this time. Because the Austin blind salamander is sympatric with the endangered Barton Springs salamander, it benefits from the conservation actions that have been and are being undertaken to recover the Barton Springs salamander.

DESCRIPTION OF MONITORING

<u>Salamander Monitoring</u> - The City of Austin conducts monthly surveys for Barton Springs and Austin blind salamanders in Barton Springs Pool, Eliza Springs, Sunken Garden Springs, and Upper Barton Springs. The City of Austin staff also conducts daily visual inspections of all habitat areas (spring sites) and address problems such as vandalism, trash and debris, introduction of exotic species, or disturbance of habitat. Such monitoring activities are required in their incidental take permit for Barton Springs salamanders issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended; however, these actions provide

opportunities to learn more about the Austin blind salamander as well.

Water Quality Monitoring - The City of Austin and U.S. Geological Survey regularly conduct water quality monitoring at Barton Springs. The City of Austin's water quality monitoring schedule includes:

- Continuous monitoring of pH, specific conductance, temperature, turbidity, total dissolved gas, dissolved oxygen, and depth using multiprobe data loggers in Barton Springs Pool, Eliza Springs, and Upper Barton Springs, when it is flowing (with plans to include Sunken Garden Springs contingent on funding).

- Twice weekly testing for bacteria for Barton Springs Pool.

- Biweekly analyses of nutrients, total suspended solids, and chlorophyll A for Barton Springs Pool. A companion sample collected at the downstream dam is analyzed for total suspended solids and chlorophyll A. Field parameters measured include pH, temperature, turbidity, dissolved oxygen, and specific conductance.

- Quarterly tests for nutrients, total suspended solids, major ions, and heavy metals (arsenic, copper, iron, lead, nickel, and zinc) in all four springs (when flowing). Field parameters measured include pH, temperature, turbidity, dissolved oxygen, and specific conductance.

- Semiannual analyses that include the above quarterly list of parameters in addition to a more comprehensive list of metals and organic compounds. Field parameters include pH, temperature, turbidity, dissolved oxygen, and specific conductance.

- Annual analyses at all four springs that include the above quarterly list of parameters in addition to a more comprehensive list of metals and organic compounds. Field parameters collected include pH, temperature, turbidity, dissolved oxygen, and specific conductance.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: The Service coordinated with Texas Parks and Wildlife Department (TPWD). TPWD agreed that the Austin blind salamander should remain a candidate for listing.

Indicate which State(s) did not provide any information or comments: NA

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: __/s/___Rich McDonald__________________ __11/17/2005_
Acting Regional Director, Fish and Wildlife Service Date

Concur: ______________________________ August 23, 2006
Director, Fish and Wildlife Service Date

Do not concur: ______________________________ ____________
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: October 2005
Conducted by: Paige Najvar, Austin ES, 512-490-0057

Comments: